

yolk decreases in volume nearly one-half in that time; and the entire embryo has less mass at the 24 than at the 1-cell stage. This shows that the protoplasmic growth during cleavage occurs at the expense of the yolk.

6. The average increase of protoplasm for each division in early cleavage (32 cells) is 6 per cent; of nucleus, 5-9 per cent; of chromatin, 8 per cent.

#### PROTOZOA IN HAY INFUSIONS

Woodruff (*Jour. Exp. Zool.*, Feb., 1912), discusses a number of series of experiments on hay infusions with a view to determining the sources and sequence of their protozoan population. To determine the sources, he (1) used sterilized hay and water, exposed to air; (2) sterilized water with fresh hay, and air excluded; (3) ordinary tap water, with sterilized hay and air excluded; and (4), as controls, fresh hay, tap water, and loosely covered vessels. The experiments, which are valuable to the ordinary laboratory worker, furnish the following conclusions:

1. Air, water, and hay are all sources of protozoa in infusions,—the air being least, and the hay most, important. But ordinary hay, added to ordinary tap water, while furnishing some protozoa, will not produce a sufficient number of representative protozoa for the study of the full sequences.

2. In order, therefore, to study standard sequences it is necessary to "seed" the infusions with matter from general laboratory cultures. In such "seeded" infusions a definite sequence of appearance, of dominance (or maximum) and of disappearance was observed. The sequence of appearance at the surface of the infusion is as follows: Monad, Colpoda, Hypotrichida, Paramecium, Vorticella, and Ameba.

3. The middle of the infusion is inhabited chiefly by free-swimming types brought there by over crowding at the top and bottom, and does not manifest so definite a sequence.

4. The appearance, in appreciable numbers, of any of these types (except Ameba), at the bottom of the infusion, coincides with, or quickly follows, its surface maximum,—and seems to indicate the beginning of its decline.

5. As biological elements entering into the determination of

the sequence may be included: the relative power and rate of division among them; the occurrence of the most satisfactory food conditions; specific excretion products, modifying the character of the water.

Fine (in the same Journal) makes a study of the chemical properties of the hay infusions and concludes that there is no intimately mutual relation between the sequence of the protozoa and the course of titratable acidity produced by the action of bacteria on the acid-yielding materials of the infusion.

#### INTERNAL FACTORS INFLUENCING SEX IN HYDATINA SENTA

Schull (Jour. Exp. Zool., Feb., 1912), summarizes some studies on the life cycle of *Hydatina senta*, as follows:

1. Long continued parthenogenesis is accompanied by a progressive decrease in the proportion of male-producers.
2. A similar decrease occurs in the size of family produced,—tho the author states that there seems to be no correlation between these two declines.
3. Individuals hatched from fertilized eggs are not only all females, but are all female-producers.
4. The sex is determined a generation in advance. That is to say, whether a given female is to be a male-producer or a female-producer (so far as the manure culture is concerned) is irrevocably decided during the growth period of the parthenogenetic egg from which the female hatches.

#### REINVIGORATION OF PARTHENOGERIC STRAINS OF HYDATINA

Whitney (Jour. Exp. Zool. Apr., 1912), finds in strains of this organism whose reproductive powers had declined thru 384 parthenogenetic generations, extending over a period of 29 months, that *inbreedings* of closely related individuals produced a slight increase in their reproductive powers; that *cross-breeding* of two such weakened races (altho originally derived parthenogenetically from the same stock) produced a sudden and pronounced increase in the rate of reproduction of the ensuing race.

#### CAN SPERM CELLS DEVELOP WITHOUT THE EGG?

Loeb and Bancroft (Jour. Exp. Zool. Apr., 1912), raise this interesting question and undertake to nurture spermatozoa in cul-